

EGG GUARDING BY MALE ASSASSIN BUGS OF THE GENUS *ZELUS* (HEMIPTERA: REDUVIIDAE)

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Introduction

Sporadic accounts of parental care of offspring in the Hemiptera-Heteroptera have appeared in the literature and are summarized by Hussey (1934) and Odhiambo (1959). In all but one or two of these cases only the female guards the brood; the only well documented exception is the reduviid *Rhinocaris albopilosus* in which only males guard the broods (Odhiambo, 1959).

The present paper is a summary of observations on the form and function of brood guarding behavior of a reduviid species (*Zelus* sp.) in which males guard the brood. My observations were made during January and February 1975, in the vicinity of Cali, Colombia in a dry tropical forest zone (Espinal and Montenegro, 1962). There the bugs are common in the outer branches of *Pithecelobium dulce* (Leguminosae), a tree locally known as the "chiminango." During the course of this study I observed approximately 60 different males with broods.

Egg Structure and Placement

The cylindrical, dark brown eggs occur in tight masses, with about 5 to 15 eggs in each mass. The eggs are about 0.3 mm in diameter, about 1.2 mm long and are attached to a branch or leaf by one end. Each egg projects from the substrate at a right angle and is in direct contact with other eggs in the mass. Freshly laid eggs are brown with fine, cream-colored seals at their exposed ends. Older unhatched eggs have darker seals and are partly covered with a slimy substance. Hatched eggs lack the seal, which is broken as the nymph leaves the egg.

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Brood Guarding Behavior

Generally the female deposits more than one egg mass in a small area and this appears to be the number of egg masses a male will guard. I observed individual males guarding as few as one to as many as seven egg masses. The male (body length 9–10 mm) usually assumes a guarding position directly over the egg masses or will stand not more than 3–4 cm from the nearest egg mass.

Two simple tests were conducted to compare the behavior of guarding and non-guarding (not positioned near any egg mass) males. In the first test, which may have simulated the approach of a large predator, I passed my hand within about 10 cm of each male. Thirteen guarding males were tested; one took flight and the others simply dodged to one side to avoid my hand. With repeated passes of my hand no escape behavior other than dodging was triggered. Seventeen non-guarding males were similarly tested: nine flew away; another five dodged to avoid my hand at first but with one or two repeated passes they too flew away; the remaining three only dodged to avoid my hand. In the process of grasping 44 guarding males for marking or removal during another part of this study, I found that none took flight; the only reaction was to dodge my hand. Application of the chi-square test to these data shows that guarding males are significantly ($p < 0.01$) less likely to flee from a potential predator than are non-guarding males.

The second test involved a model parasite made of a bit of black tape attached to the end of stiff nylon line on the end of a long hollow glass tube. I carefully presented the model parasite so that the male would only perceive the model. Of the ten guarding males tested, one avoided the model completely, one exhibited no reaction, and seven others readily attacked the model by grasping it with the forelegs. The attacks appeared especially aggressive when the model came close to the egg masses. The tenth male, which was about 7 cm from his egg masses, avoided the model when it was brought near him. However, when the model approached the egg masses the male was guarding, he rapidly moved to attack it.

The non-guarding males were less ready to attack the model wasp. Of eight non-guarding males tested, only one readily attacked the model. Four males avoided the model parasite but when touched by it they did attack. The other three non-guarding males avoided the model completely. The chi-square test results show that there

was a significant ($p < 0.01$) difference between the guarding and non-guarding males in readiness to attack the model parasite.

After hatching, the nymphs appeared to stay very close to the eggs and guardian male for several days (a maximum of seven days in one case). In one instance in the field I watched a male capture a small insect about 15–30 cm from the egg masses where the nymphs were gathered. He promptly returned to the nymphs with the insect and the nymphs fed on it. I attempted unsuccessfully to repeat this observation in the lab with a few males, several nymphs, and tiny insects. Dr. William Eberhard (personal communication) reports seeing recently (February 1977) a guarding male holding a prey with a cluster of nymphs gathered around apparently sucking the prey.

Rates of Parasitism

On January 28, I finished marking 22 males guarding egg masses (control group) as well as the sites of the egg masses. The males were marked with white airplane dope on the anterior dorsal surface of the thorax. This did not appear to interfere with their normal functioning. I also removed 22 males from the masses they were guarding and marked the sites of the egg masses (experimental group). Each tree in which I made the study contained both control and experimental groups distributed roughly at random. However, if different groups of egg masses were very close together, I labeled them all control or all experimental so that the presence of a nearby male would not affect parasitism of unguarded eggs. The purpose of this experiment was to see if the presence of the guarding male affected the rate of parasitism of the eggs.

On February 20, I collected 57 egg masses from the marked sites with guarding males and 63 egg masses which had been left unguarded. Of the 57 guarded egg masses, 12 (21%) had been parasitized (distinguished by eggs with unbroken seals and tiny exit holes near their attached ends); whereas 35 (55%) of the 63 unguarded egg masses had been parasitized. A chi-square test shows that the difference between the rate of parasitism of unguarded and guarded egg masses is statistically significant ($p < 0.01$). Five tiny wasp parasites of the genus *Telenomus* (Scelionidae) hatched from one egg mass in the experimental group soon after it was collected.

Discussion

Odhiambo (1959) points out that broodguarding Hemiptera exhibit a strong tendency to remain with egg masses when they are disturbed in ways that in other situations would cause them to take flight. I found this to be true for *Zelus* males.

A few direct observations and some circumstantial evidence indicate that broodguarding in Hemiptera helps to protect eggs from egg parasites (Odhiambo, 1959). I have tested this hypothesis for *Zelus* in two ways and the results of both tests strongly support the hypothesis. There is no evidence, such as that found by Eberhard (1975) in his study of egg guarding by pentatomid bugs, that the guarding male makes the eggs more vulnerable to certain parasites.

My observation and an observation by Eberhard show that *Zelus* parental care continues during early nymphal life in the form of feeding and perhaps protection.

Further study of *Zelus* broodguarding should be directed towards answering questions such as the following: What is the genetic relationship between the males and the eggs which they guard? I would predict that the guarding male is the genetic father of at least some of the eggs he guards; otherwise there would be little or no selective advantage in the guarding behavior. How common is the parental feeding which was observed? Exactly how do the males react to real parasites and predators? How does the number and distribution of egg masses affect egg rearing efficiency?

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